

Application Serial No: 10/509,463
Responsive to the Office Action mailed on: August 24, 2009

REMARKS

This Response is in response to the Office Action mailed on August 24, 2009.
Claims 5 and 7-11 are pending with claims 10 and 11 being withdrawn.

§112, 1st Paragraph Rejection:

Claims 5 and 7-9 are rejected as failing to comply with the written description requirement. In particular, the rejection asserts an "accelerated electron beam" emitted from the electron beam source is not supported in the specification. However, Applicants note that it would be understood by one skilled in the art at the time of the invention that in order for the electron beam to be used to evaporate the first thin film, the electron beam source must emit an accelerated electron beam in order to be capable of evaporating the first thin film material by heating.

Applicants also submit an article from Wikipedia on "Electron Beam Physical Vapor Deposition" (http://en.wikipedia.org/wiki/Electron_beam_physical_vapor_deposition) and a product marketing publication from JEOL for "Electron Beam Sources and Power Supplies", with the relevant portions highlighted, that provides further evidence that an accelerated electron beam is required in order to evaporate a thin film material. As discussed in the Wikipedia article, in a thin film deposition process a generated electron beam is accelerated in order to melt and evaporate a liquid ingot material (see the last full paragraph on page 1 of the Wikipedia article). The JEOL product marketing publication also lists a variety of electron beam sources each with the feature of an accelerating voltage for use in evaporating a material (see pages 2-8, 10 and 11 of the JEOL publication). Withdrawal of this rejection is requested.

§103 Rejections:

Claims 5, 7 and 9 are rejected as being unpatentable over DeLozanne (US Patent No. 5,004,721) in view of Higuchi (US Patent No. 5,079,224) and further in view of Yanai (US Patent No. 4,511,594). This rejection is traversed.

Claim 5 is directed to an apparatus for manufacturing a thin film in which the thin film is formed on a supporting base that recites, among other features, an electron beam source that is arranged in the vacuum container and emits an accelerated electron beam to

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be used to evaporate the first thin film material by heating using an electron beam heating method. Claim 5 also recites that a path along which the accelerated electron beam emitted from the electron beam source reaches the electron beam evaporation source intersects with a line segment connecting the resistance heating evaporation source with the surface to be vapor-deposited.

The combination of DeLozanne and Higuchi does not teach or suggest these features. The rejection continues to rely on Higuchi for teaching a path along which the accelerated electron beam emitted from the electron beam source reaches the electron beam evaporation source intersects with a line segment connecting the resistance heating evaporation source with the surface to be vapor-deposited.

However, Applicants note that Higuchi does not teach that an electron beam is accelerated. Higuchi merely teaches that thermionic beams (unaccelerated electrons) intersect with evaporated streams of metallic elements in order to partially ionize the metallic streams, which allows the adhesion and crystallization of a resulting thin film to be improved (see column 3, lines 37-42 and column 4, lines 51-54 of Higuchi).

Accordingly, Higuchi cannot teach an apparatus that is configured such that a path along which the accelerated electron beam emitted from the electron beam source reaches the electron beam evaporation source intersects with a line segment connecting the resistance heating evaporation source with the surface to be vapor-deposited.

Further, it would not be obvious to one skilled in the art to modify the apparatus of DeLozanne with features of Higuchi to obtain the features of claim 5. The rejection argues that one skilled in the art would be motivated to modify the configuration of DeLozanne based on the teachings of Higuchi in order to ionize the barium prior to deposition to produce a superior thin film. However, one skilled in the art would not look to modify the configuration of DeLozanne, which uses an electron beam source 14a to evaporate yttrium (i.e., emits an accelerated electron beam), based on prior art that teaches a configuration that does not use an electron beam source to evaporate a metal.

Also, modifying the configuration of DeLozanne with features of Higuchi in order to ionize metallic streams would require replacing the electron beam source 14a, which is used to evaporate yttrium, with a thermionic beam generator 41-43 that does not evaporate a thin film but merely ionizes metallic streams (see column 3, lines 37-42 and

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column 4, lines 51-54 of Higuchi). Thus, combining DeLozanne with Higuchi would result in a configuration in which an electron beam source is provided that does not emit an accelerated electron beam and therefore cannot evaporate a first thin film material, as required by the electron beam source of claim 5. Accordingly, it would not be obvious to one skilled in the art to modify the configuration of DeLozanne based on the teachings of Higuchi to obtain a configuration in which a path along which the accelerated electron beam emitted from the electron beam source reaches the electron beam evaporation source intersects with a line segment connecting the resistance heating evaporation source with the surface to be vapor-deposited, as recited in claim 5.

Yanai does not overcome the deficiencies of DeLozanne and Higuchi. It is irrelevant that Yanai teaches an electron beam source emitting an accelerated electron beam. Applicants note that DeLozanne already teaches an electron beam source that evaporates a thin film material, and therefore teaches an electron beam source that emits an accelerated electron beam. Thus, Yanai does not appear to impact the patentability of the claimed features.

For at least these reasons claim 5 is not suggested by the combination of DeLozanne, Higuchi and Yanai and should be allowed. Claims 7 and 9 depend from claim 5 and should be allowed for at least the same reasons.

Claim 8 is rejected as being unpatentable over DeLozanne in view of Higuchi and further in view of Suzuki (US Patent No. 4,622,919). This rejection is traversed. Claim 8 depends from claim 5 and should be allowed for at least the same reasons described above. Applicants do not concede the correctness of this rejection.

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Conclusion:

Applicants respectfully assert that the pending claims are in condition for allowance. If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicants' primary attorney-of record, Douglas P. Mueller (Reg. No. 30,300), at (612) 455-3804.



Dated: November 18, 2009

Respectfully submitted,

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By: 

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Electron beam physical vapor deposition

From Wikipedia, the free encyclopedia

Electron Beam Physical Vapor Deposition or **EBPVD** is a form of physical vapor deposition in which a target anode is bombarded with an electron beam given off by a charged tungsten filament under high vacuum. The electron beam causes atoms from the target to transform into the gaseous phase. These atoms then precipitate into solid form, coating everything in the vacuum chamber with a thin layer of the anode material.

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- 3 Material evaporation methods
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- 5 Ion beam assisted deposition
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- 7 Disadvantages of EBPVD
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Introduction

Thin film deposition is a process applied in the semiconductor industry to grow electronic materials, and in the aerospace industry to form thermal and chemical barrier coatings to protect surfaces against corrosive environments and to modify surfaces to have the desired properties. The deposition process can be broadly classified into physical vapor deposition (PVD) and chemical vapor deposition (CVD). In CVD, the film growth takes place at high temperatures, leading to the formation of corrosive gaseous products, and it may leave impurities in the film. The PVD process can be carried out at lower deposition temperatures and without corrosive products, but deposition rates are lower and it leaves residual compressive stress in the film. Electron beam physical vapor deposition, however, yields a high deposition rate from 0.1 $\mu\text{m} / \text{min}$ to 100 $\mu\text{m} / \text{min}$ at relatively low substrate temperatures, with very high material utilization efficiency. The schematic of an EBPVD system is shown in Fig 1.

Thin film deposition process

In an EBPVD system, the deposition chamber is evacuated to a pressure of 10^{-4} Torr. The material to be evaporated is in the form of ingots. There are as many as six electron guns, each having a power from few tens to hundreds of kW. Electron beams can be generated by thermionic emission, field electron emission or the anodic arc method. The generated electron beam is accelerated to a high kinetic energy and focused towards the ingot. When the accelerating voltage is between 20 kV – 25 kV and the beam current is a few amperes, 85% of the kinetic energy of the electrons is converted into thermal energy as the beam bombards the surface of the ingot. The surface temperature of the ingot increases resulting in the formation of a liquid melt. Although some of incident electron energy is lost in the excitation of X-rays and secondary emission, the liquid ingot material evaporates under vacuum.

The ingot itself is enclosed in a copper crucible, which is cooled by water circulation. The level of molten liquid pool on the surface of the ingot is kept constant by vertical displacement of the ingot.

The

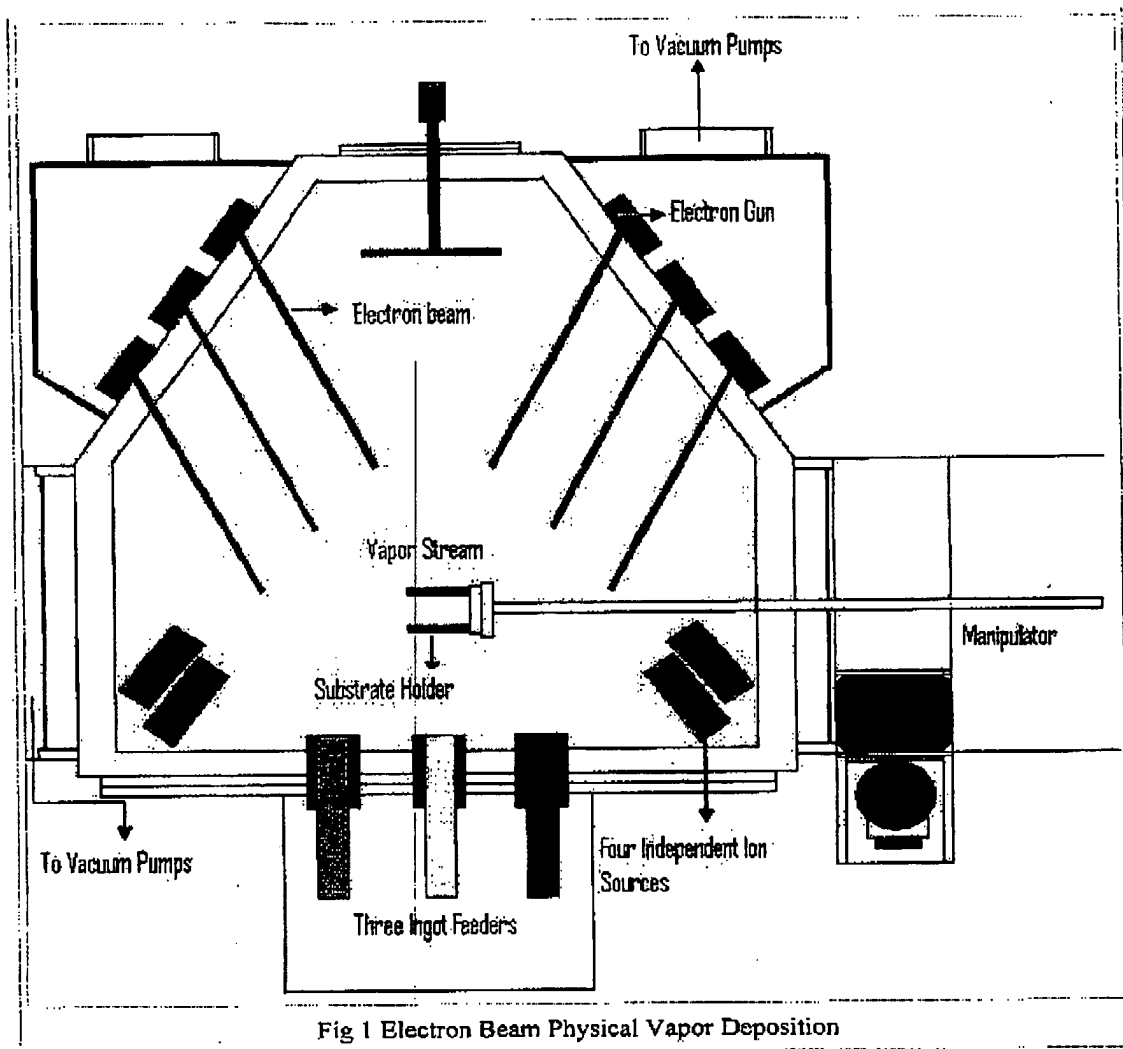


Fig 1 Electron Beam Physical Vapor Deposition

number of ingot feeders depends upon the material to be deposited. The evaporation rate may be of the order of 10^{-2} g/cm² sec.

Material evaporation methods

Refractory carbides like titanium carbide and borides like titanium boride and zirconium boride can evaporate without undergoing decomposition in the vapor phase. These compounds are deposited by direct evaporation. In this process these compounds, compacted in the form of an ingot, are evaporated in vacuum by the focused high energy electron beam and the vapors are directly condensed over the substrate.

Certain refractory oxides and carbides undergo fragmentation during their evaporation by the electron beam, resulting in a stoichiometry that is different from the initial material. For example, alumina, when evaporated by electron beam, dissociates into aluminum, AlO_3 and Al_2O . Some refractory carbides like silicon carbide and tungsten carbide decompose upon heating and the dissociated elements have different volatilities. These compounds can be deposited on the substrate either by reactive evaporation or by co-evaporation. In the reactive evaporation process, the metal is evaporated from the ingot by the electron beam. The vapors are carried by the reactive gas, which is

oxygen in case of metal oxides or acetylene in case of metal carbides. When the thermodynamic conditions are met, the vapors react with the gas in the vicinity of the substrate to form films. Metal carbide films can also be deposited by co-evaporation. In this process, two ingots are used, one for metal and the other for carbon. Each ingot is heated with a different beam energy so that their evaporation rate can be controlled. As the vapors arrive at the surface, they chemically combine under proper thermodynamic conditions to form a metal carbide film.

The substrate

The substrate on which the film deposition takes place is ultrasonically cleaned and fastened to the substrate holder. The substrate holder is attached to the manipulator shaft. The manipulator shaft moves translationally to adjust the distance between the ingot source and the substrate. The shaft also rotates the substrate at a particular speed so that the film is uniformly deposited on the substrate. A negative bias D.C. voltage of 200 V – 400 V is applied to the substrate. Focused high energy electrons from one of the electron guns preheat the substrate.

Ion beam assisted deposition

EBPVD systems are equipped with ion sources. These ion sources are used for substrate etching and cleaning, sputtering the target and controlling the microstructure of the substrate. The ion beams bombard the surface and alter the microstructure of the film. When the deposition reaction takes place on the hot substrate surface, the films develop an internal tensile stress due to the mismatch in the coefficient of thermal expansion between the substrate and the film. High energy ions can be used to bombard these ceramic thermal barrier coatings and change the tensile stress into compressive stress. Ion bombardment also increases the density of the film, changes the grain size and modifies amorphous films to polycrystalline films. Low energy ions are used for the surfaces of semiconductor films.

Advantages of EBPVD

The deposition rate in this process can be as low as 1 nm per minute to as high as few micrometers per minute. The material utilization efficiency is high relative to other methods and the process offers structural and morphological control of films. Due to the very high deposition rate, this process has potential industrial application for wear resistant and thermal barrier coatings in aerospace industries, hard coatings for cutting and tool industries, and electronic and optical films for semiconductor industries.

Disadvantages of EBPVD

EBPVD is a line-of-sight of deposition process. The translational and rotational motion of the shaft helps for coating the outer surface of complex geometries, but this process cannot be used to coat the inner surface of complex geometries. Another potential problem is that filament degradation in the electron gun results in a non-uniform evaporation rate.

References

1. D. Wolfe, Thesis (Ph.D), Thesis 2001dWolfe,DE, Synthesis and characterization of TiC, TiBCN, TiB₂/TiC and TiC/CrC multilayer coatings by reactive and ion beam assisted, electron beam-physical vapor deposition (EB-PVD) The Pennsylvania State University, 1996.
2. Movchan, B. A. (2006). *Surface Engineering*. 22. pp. 35–46.
3. Wolfe, D.; J. Singh (2000). *Surface and Coatings Technology*. 124. pp. 142–153.

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Retrieved from "http://en.wikipedia.org/wiki/Electron_beam_physical_vapor_deposition"

Categories: Thin film deposition

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JEBC-BS/JST series

JEOL
Serving Advanced Technology

JEOL Meets Any Industrial Needs

JEBC/BS/IST Series

Electron Beam Sources and Power Supplies

Since its foundation, JEOL has been a leader in the development of electron beam technology. Our extensive product line and range of applications have made us a world leader in the field. As a result, JEOL has been able to provide a wide range of products to meet the needs of our customers. Our products are designed to be reliable, efficient, and easy to use. They are also designed to be flexible, so that they can be used in a wide range of applications. Our products are designed to be durable, so that they can last for many years. Our products are designed to be easy to maintain, so that they can be kept in good working order. Our products are designed to be easy to use, so that they can be used by a wide range of people. Our products are designed to be flexible, so that they can be used in a wide range of applications. Our products are designed to be durable, so that they can last for many years. Our products are designed to be easy to maintain, so that they can be kept in good working order. Our products are designed to be easy to use, so that they can be used by a wide range of people.

Features of Electron Beam Evaporation

Direct evaporation materials with high thermal efficiency and high melting point, such as W, Ta, and Mo and others, can be evaporated. The use of a water-cooled copper cathode with a resistance heater does not cause the evaporator material to react with the material, thus allowing for a wide range of materials to be evaporated. The use of a tungsten filament heater does not cause the evaporator material to react with the material, thus allowing for a wide range of materials to be evaporated. The use of a tungsten filament heater does not cause the evaporator material to react with the material, thus allowing for a wide range of materials to be evaporated.

Features of JEOL Electron Beam Sources and Power Supplies

Our electron beam evaporation system is designed to be reliable, efficient, and easy to use. It is also designed to be flexible, so that it can be used in a wide range of applications. Our system is designed to be durable, so that it can last for many years. Our system is designed to be easy to maintain, so that it can be kept in good working order. Our system is designed to be easy to use, so that it can be used by a wide range of people. Our system is designed to be flexible, so that it can be used in a wide range of applications. Our system is designed to be durable, so that it can last for many years. Our system is designed to be easy to maintain, so that it can be kept in good working order. Our system is designed to be easy to use, so that it can be used by a wide range of people.

JEOL Products

Electron Beam Sources

Electron Beam Power Supplies

Electron Beam Evaporation Systems

Electron Beam Evaporation Systems

Electron Beam Evaporation Systems

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Electron Beam Evaporation Systems

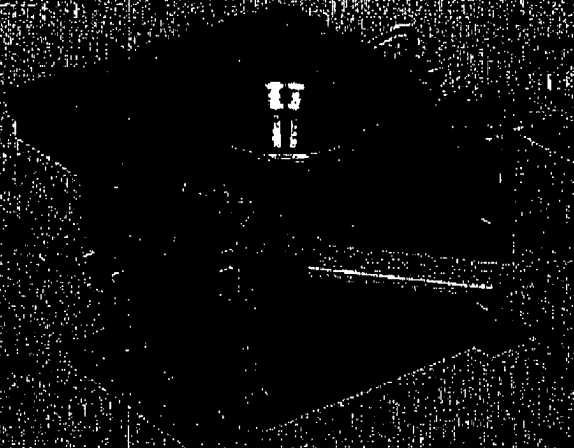
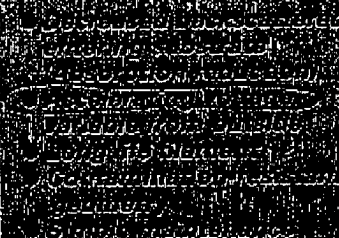
Electron Beam Evaporation Systems

Electron Beam Evaporation Systems

Electron Beam Evaporation Systems

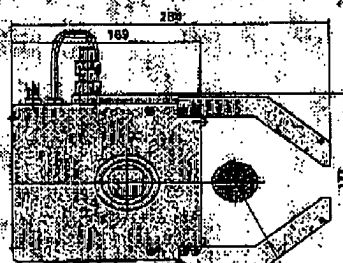
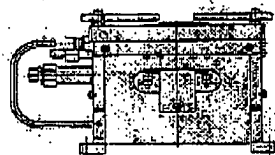
RS-60050K

Electron Beam Sources and Neutral Beam Sources



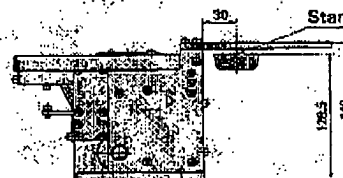
External dimensions

Unit : 2000



Standard position for beam irradiation

Standard surface

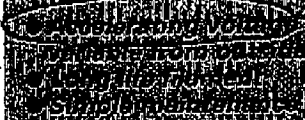


Specifications

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PS-6004D2C

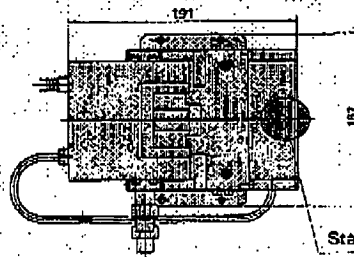
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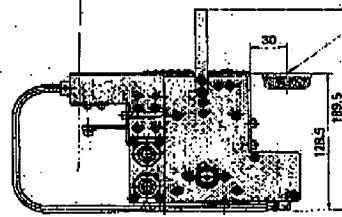
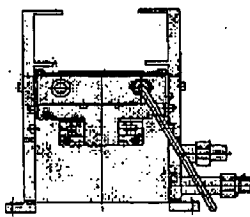
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Standard position for beam irradiation



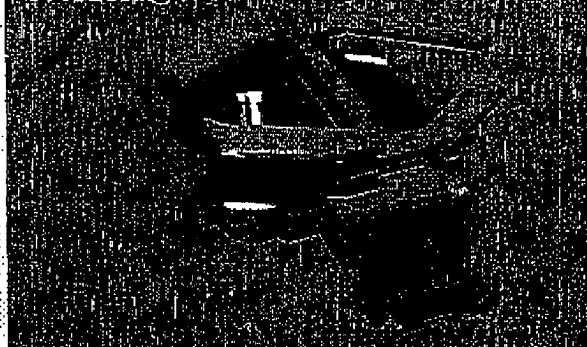
Standard surface

Specifications

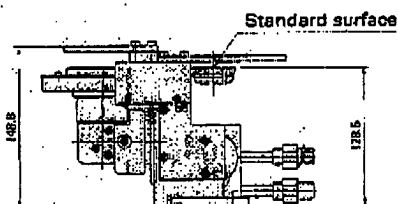
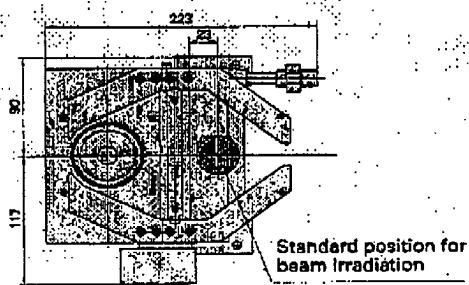
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 100. DATE OF THE REPORT

EBG-102UB4S**Electron Beam Source****EBG-102UB5S****Electron Beam Source**

Electron beam source
 for surface treatment
 of various materials

**External dimensions**

Unit: mm

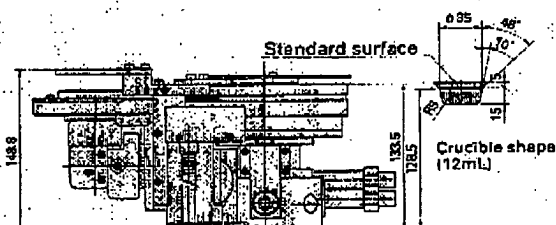
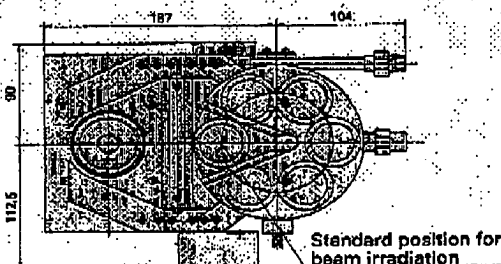
**Specifications**

Power	100W
Beam diameter	10mm
Beam shape	Rectangular
Beam intensity	100W/cm²
Beam speed	100mm/s
Beam direction	Vertical
Beam control	Manual
Beam safety	Interlock
Beam maintenance	Easy
Beam warranty	1 year

Electron beam source
 for surface treatment
 of various materials

**External dimensions**

Unit: mm

**Specifications**

EBG-102UB5S EBG-102UB4S

Power	100W	100W
Beam diameter	10mm	10mm
Beam shape	Rectangular	Rectangular
Beam intensity	100W/cm²	100W/cm²
Beam speed	100mm/s	100mm/s
Beam direction	Vertical	Vertical
Beam control	Manual	Manual
Beam safety	Interlock	Interlock
Beam maintenance	Easy	Easy
Beam warranty	1 year	1 year

Ref. page 11

EBQ-203UB4H

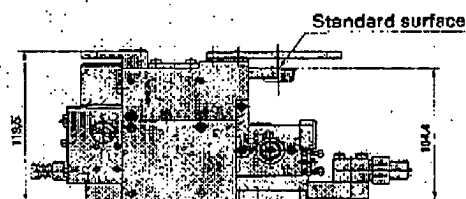
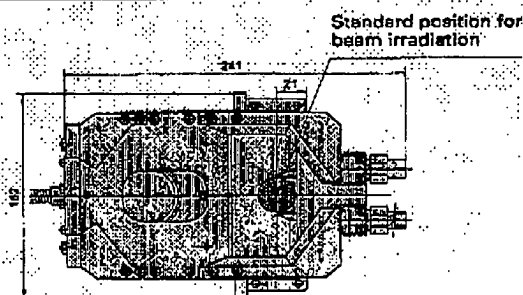
Electron Beam Source

EBQ-203UB4H**EBQ-203UB6S**

Electron Beam Source

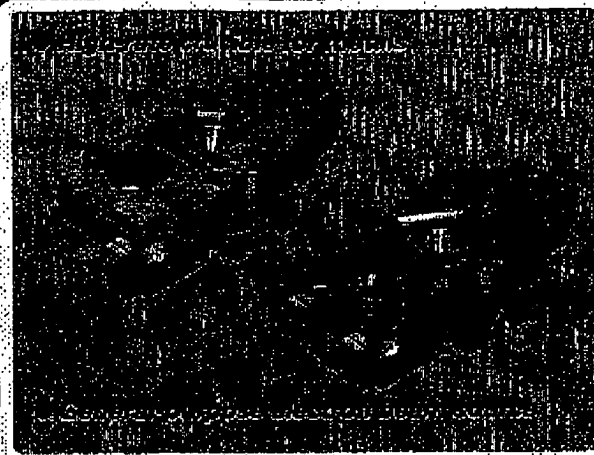
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Unit:mm

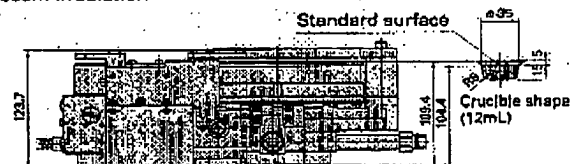
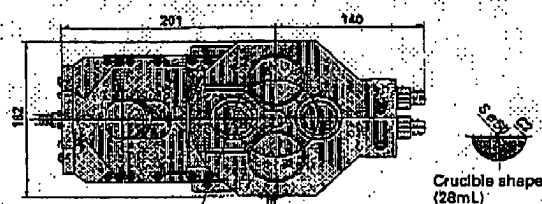
**Specifications**

1200W	1200W
2000W	2000W
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4000W	4000W
5000W	5000W
6000W	6000W
7000W	7000W
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9000W	9000W
10000W	10000W
11000W	11000W
12000W	12000W
13000W	13000W
14000W	14000W
15000W	15000W
16000W	16000W
17000W	17000W
18000W	18000W
19000W	19000W
20000W	20000W

See page 11

**External dimensions**

Unit:mm

**Specifications**

EBQ-203UB4H EBQ-203UB6S

1200W	1200W
2000W	2000W
3000W	3000W
4000W	4000W
5000W	5000W
6000W	6000W
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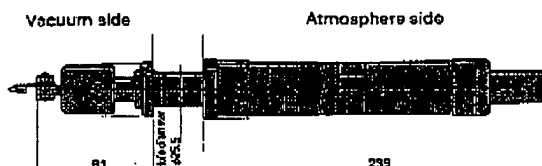
See page 11

High Voltage Feedthrough / Low Voltage Feedthrough / Filament and Grid Assemblies

High Voltage Feedthrough

Unit: mm

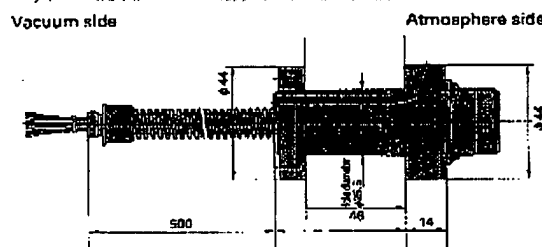
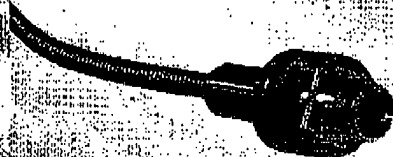
BS-63050HV25G



Low Voltage Feedthrough

Unit: mm

BS-63010LV500



Filaments

Parts No.

801236843



HL018609 Δ 4
10PCS/CA

D=0.55 ϕ

420900098



PB438124 Δ 4
10PCS/CA

D=0.8 ϕ

801247683



PB438168
10PCS/CA

D=0.8 ϕ

812180313



3PCS/CA

D=0.55 ϕ

Grid Assemblies

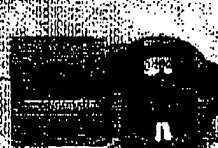
Parts No.

7804 49746
GSBG-102GA



For 102UHQ/102UB

7804 49754
GSBG-GA02



For 203

7894 00481



For 60030/60040

7804 05251

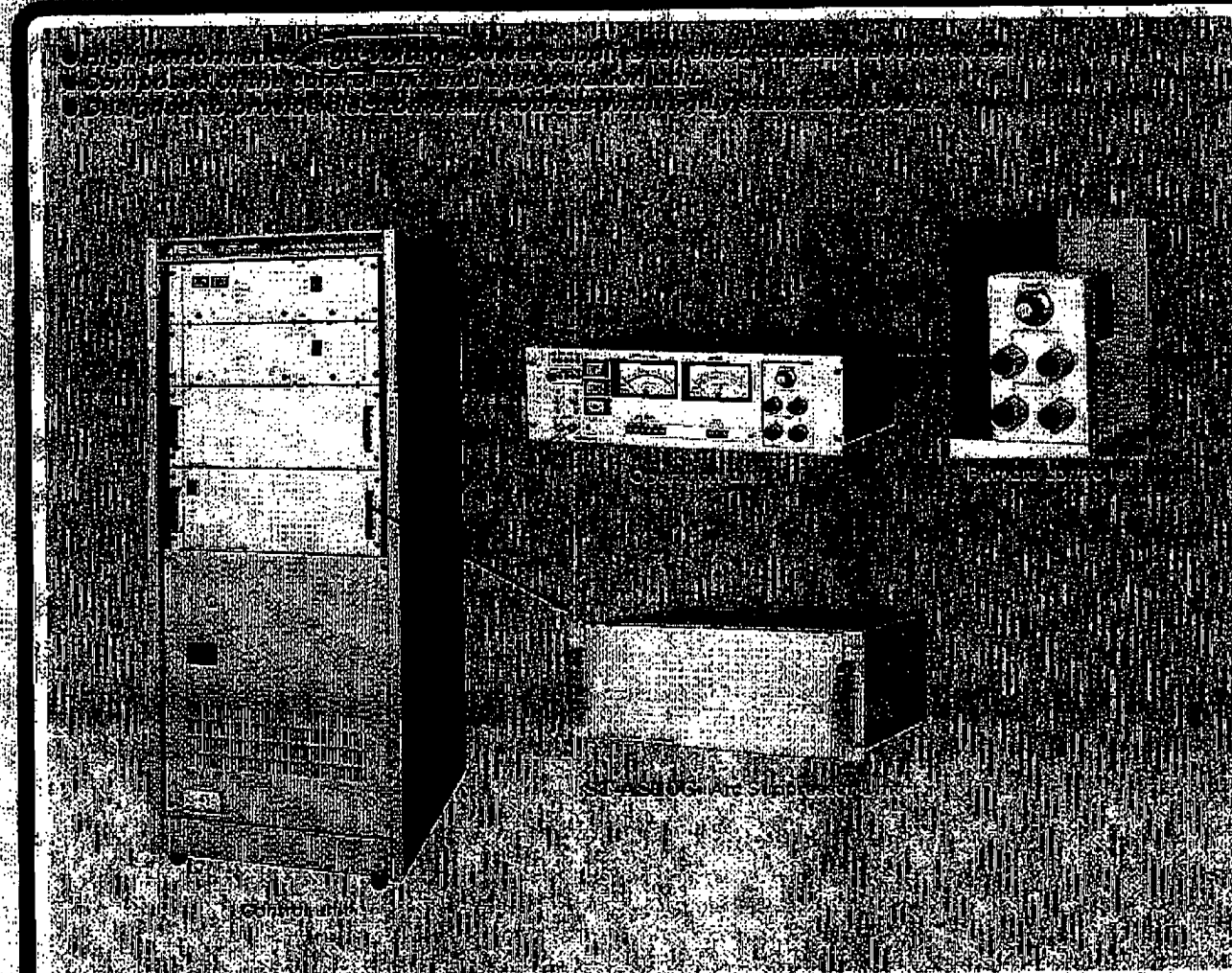


For 60050

When you want to order filaments or grid assemblies, please contact JFOL DATUM Ltd.
Parts Administration Group : TEL +81-42-542-1192 FAX +81-42-546-0307

JST-F Series

EE Source Power Supplies



Features

- **Energy-saving power supplies using SCR control.**
- **Can readily be configured to a computer-controlled system.**
Number of external I/O terminals INPUT 14 (standard), 25 (optional)
 OUTPUT 9 (standard), 7 (optional)
- **Remote controller provided as standard.**
The emission, X-Y positioning, and X-Y scan width setting controls are attached to the controller by a magnet catch.
Removing the magnet catch and fitting an extension cable will offer you a remote controller.
- **Arc suppresser unit (ST-AS10G) provided as standard.**
Anomalous electric discharge can be suppressed rapidly.
- **Many options can be installed.**
Selected or divided use of two electron-beam sources, power control by external signals, and 2-point or 3-point electron-beam scanning control can be used simply by adding optional units.
- **Power trouble and abnormalities detected and displayed with LEDs.**

Specifications

		JST-3F	JST-10F	JST-16F
Output	Maximum Output	500W	10kW	15kW
	Output Voltage	DC 4 to 18V	DC 4 to 10V	DC 4 to 10V
	Series Output	0 to 10A	0 to 1A	0 to 0.6A
	Maximum Power	500W	100W (Maximum)	150W
Output Inductance	Equivalent Inductance	1.5mH	0.15mH	0.15mH
	Self Inductance	2mH (50% duty extension)	0.2mH (50% duty extension)	0.2mH (50% duty extension)
Safety Device	Operation Protection	POWER ON/OFF PROTECTION, OVERHEAT PROTECTION, EXTERNAL		
	Overheat Protection	Active Switch Display, 10min. pause, INTERLOCK, 5min. pause, 15min. pause		
	Emergency Stop	Emergency Switch, 0.5 to 20ms, 0.1 to 20ms, 0.1 to 20ms, 0.1 to 20ms		
	Emergency Stop	Emergency Stop, 0.5 to 20ms, 0.1 to 20ms, 0.1 to 20ms, 0.1 to 20ms		
External	External	External	External	External
Output Voltage	Output Voltage	50V, 100V, 150V, 200V, 250V, 300V, 350V, 400V, 450V, 500V, 550V, 600V, 650V, 700V, 750V, 800V, 850V, 900V, 950V, 1000V		
	Operation Time	10min. (100V), 10min. (150V), 10min. (200V), 10min. (250V), 10min. (300V), 10min. (350V), 10min. (400V), 10min. (450V), 10min. (500V), 10min. (550V), 10min. (600V), 10min. (650V), 10min. (700V), 10min. (750V), 10min. (800V), 10min. (850V), 10min. (900V), 10min. (950V), 10min. (1000V)		
Weight	Weight	Approximately 360g	Approximately 362g	Approximately 350g
	Weight	Approximately 360g	Approximately 362g	Approximately 350g
Signal	Signal	Signal	Signal	Signal
	Signal	Signal	Signal	Signal
	Signal	Signal	Signal	Signal
	Signal	Signal	Signal	Signal

ST-AS10G Arc Suppressor Unit

The ST-AS10G rapidly suppresses anomalous electric discharge during electron beam evaporation. In addition, this unit suppresses the noise arising during electric discharge and prevents evaporation from being interrupted.

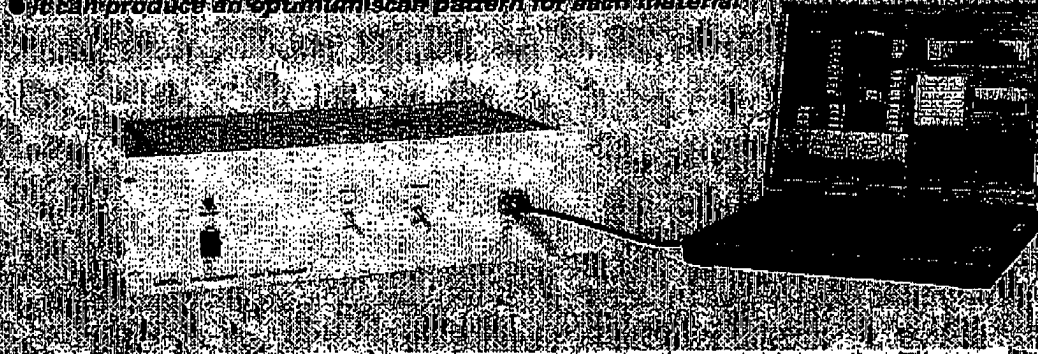
1. Maximum test voltage	4 to 10 kv, 1.6A
2. Voltage pulse rate	8×10^{-4} - 5 pulses/sec
3. Pulse width	0.5ms or less
4. Maximum voltage over shoot after test pulse	20% or less, 3ms or less

*Specifications subject to change without prior notice.

BS-64010SCT

Scan Controller

- This is a tool to control melt spot
- It can produce an optimum scan pattern for each material



Features

The software can provide an easy control of scan pattern visually, which used to be cumbersome and time-consuming.

- Setting of the optimum scan pattern for each material is possible.
- The dwell time of beam spot can be adjusted visually.

Four modes are selectable:

- Normal, X-Y scan mode, circle mode, arbitrary position mode and line scan mode.

The controller can memorize 15 scan patterns per electron beam source. You can store optimum scan patterns for each material.

- Even when scan patterns are changed, it is not necessary to change the boards inside the power supply.
- The PC can be disconnected from the controller after scan patterns are memorized in the built-in memory.
- The controller can memorize 15 patterns per electron gun. So, 30 patterns can be memorized when two electron guns are used.

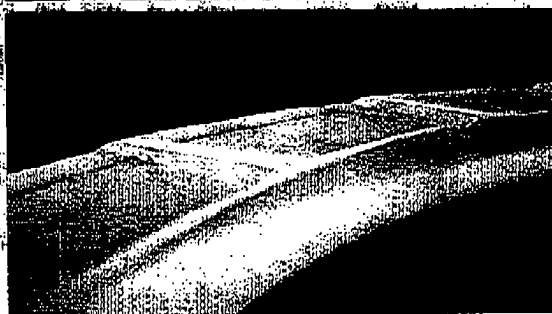
A variety of settings are also position, scan, offset, scan frequency, tilt angle.

Example and optimized scan pattern

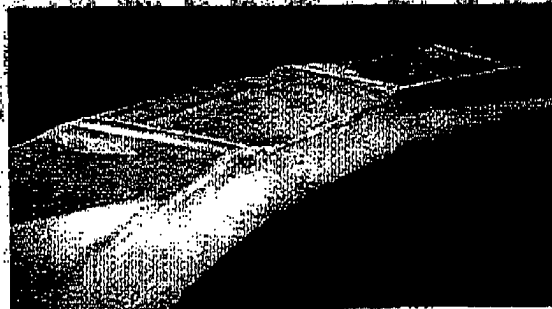
Unit: mm

Controlling the scan pattern has improved melt spot of quartz.

Controlled and optimized scan pattern



Without control

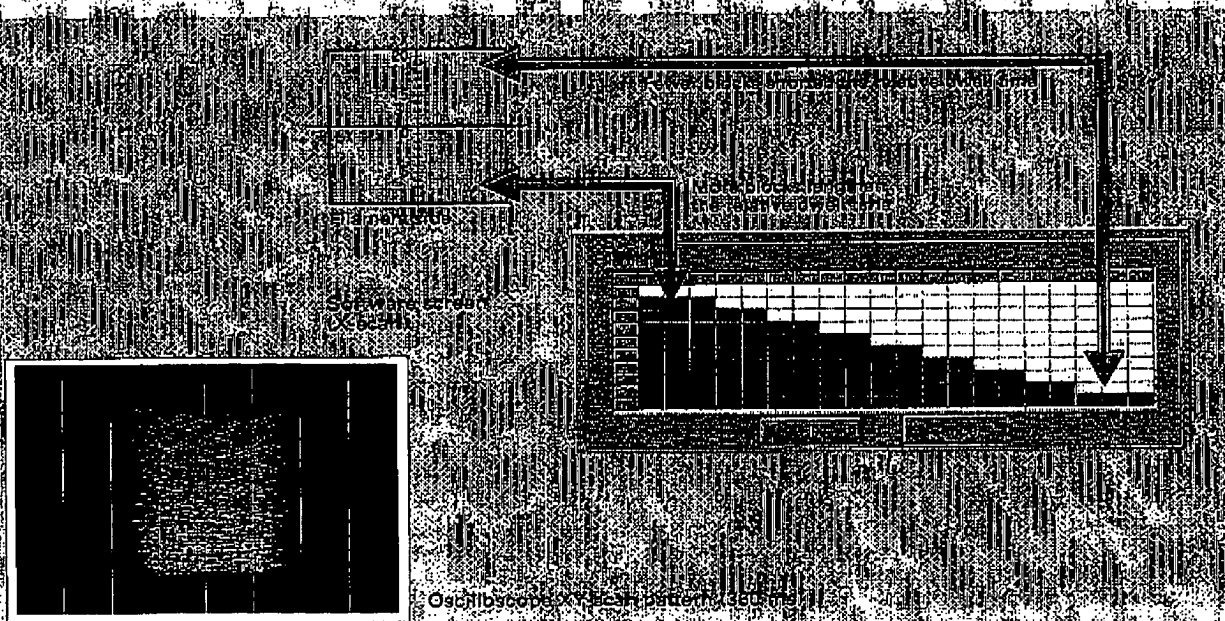


(Thickness of cross section in micrometers.)

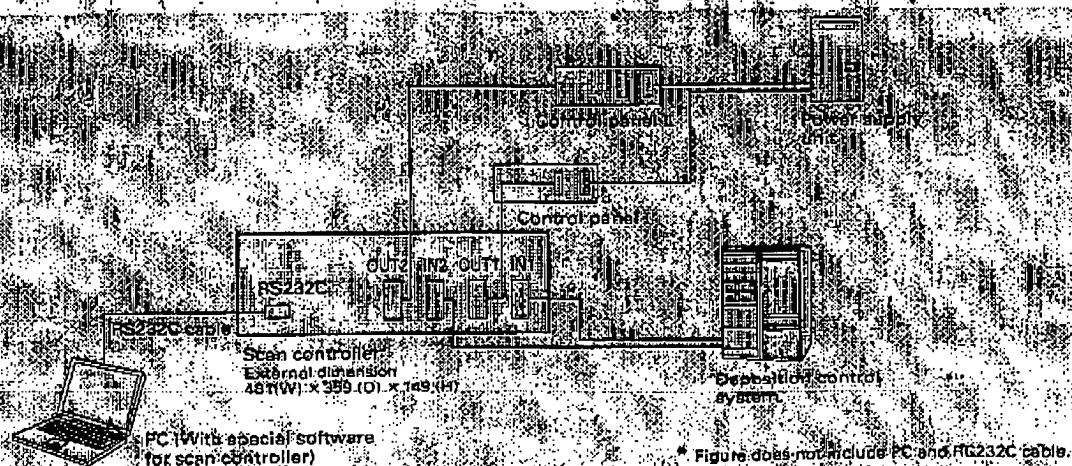
Example of Scan Pattern Setting

The controller divides the scan field in the X direction into 20 points, and sets the relative dwell time of the beam for each scan point.

The figure below shows one example. Here, the controller sets a relatively short dwell time in the back and a longer dwell time in the front (the filament side). As the number of blocks increases, the dwell time becomes longer.



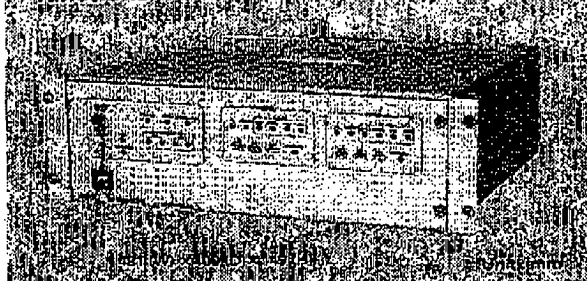
Connection Diagram



BS-640610PE

DeviceNet Operation unit

- Compatible with DeviceNet communication and RS-232C communication
- Control function operation unit for two electron beam sources housed in one unit
- Pattern operation and residual-field erasing functions



This operation unit controls the JST-F series power supplies via DeviceNet communication. Can replace an existing operation unit for the JST-F series power supplies with this operation unit.

Features

- One unit incorporates a control function for two electron beam sources.
- DeviceNet communication enables external PC control or sequencer control.
- Conventional remote control is replaced by PC control via RS-232C communication.
- Accelerating voltage and deflection current can be externally controlled (JEBG-102 series, BS-60040VDGN, BS-60050EBS and JEBG-163MB).
- Incorporates a residual-field erasing function.
- Various patterns can be operated (filament annealing, melting down, etc.).*
- Scan Controller can be externally controlled (possible to specify scan pattern).
- Emission-current control can be selected from DeviceNet control and analog control (0 to 10 V).
- Incorporates a filament-monitoring function (outputting Filament ON accumulation time and Filament current).
- Equipped with ST-EXTSIG external-signal control function.

* Customers are required to set pattern.

Other Attachments for Power Supplies

- ST-203 EB source divider
(corresponding power supply: JST-10F, JST-16F)
Operation unit: 2
- ST-202 EB source selector
(corresponding power supply: JST-3F, JST-10F, JST-16F)
Operation unit: 1
- ST-EXTSIG External signal I/O
(corresponding power supply: JST-3F, JST-10F, JST-16F)

ST-TRIPLE (F) ST-2PNS (F) Controller

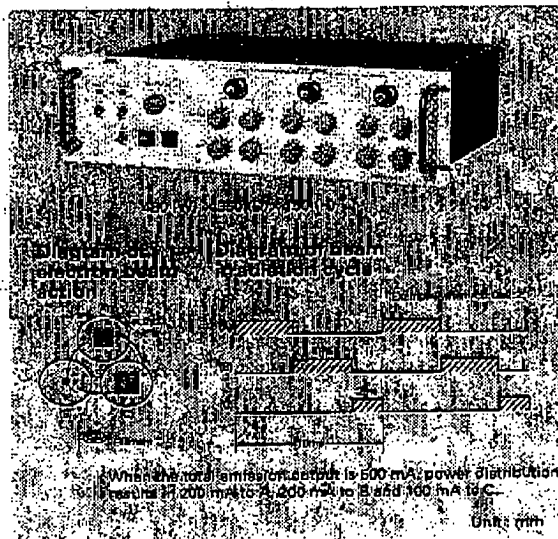
ST-TRIPLE (F) Triple source controller

(corresponding electron beam source: JEBG-303UA)

The triple source controller is attached to the power supply and enables simultaneous evaporation of three evaporants in one beam source. Electron beam is irradiated onto three pockets of a crucible at a high speed of 10 ms/cycle (1/100 sec) while scanning over each crucible pocket. In addition, you can set beam-irradiation position for the pockets and scan width arbitrarily.

Principle

Irradiation time of each beam A, B and C is determined by the set power rate signals (A: B: C). Then, superposing each scan signal on the power rate signals sets the beam positions and shapes.



ST-2PNS (F) 2 point controller

(corresponding electron beam source: JEBG-102UB)

The 2 point controller is attached to the power supply and irradiates two points with an electron beam alternately, enabling simultaneous evaporation of two materials.

- Irradiation rate for two pockets can be changed from 100:1 to 1:100.
- In the two crucibles, it is possible to scan the electron beam at high speed for both X and Y axes.
- Crucible: maximum central clearance 20 mm, volume 2 mL for each.

